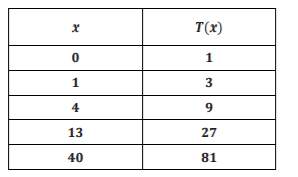
***CLASS COPY – DO NOT WRITE ON THIS***

CW/HW 30: Linear vs. Exponential Functions

**Honors Geometry**

1. Terence looked down the second column of the table below and noticed that . Because of his observation, he claimed that the input-output pairs in this table could be modeled with an exponential function. Explain why Terence is correct or incorrect. If he is correct, write a formula for the exponential function that generates the input-output pairs given in the table. If he is incorrect, determine and write a formula for a function that generates the input-output pairs given in the table.
2. A river has an initial minnow population of 𝟒𝟎, 𝟎𝟎𝟎 that is growing at 𝟓% per year. Due to environmental conditions, the amount of algae that minnows use for food is decreasing, supporting 𝟏, 𝟎𝟎𝟎 fewer minnows each year. Currently, there is enough algae to support 𝟓𝟎, 𝟎𝟎𝟎 minnows. Is the minnow population increasing linearly or exponentially? Is the amount of algae decreasing at a linear or an exponential rate? In what year will the minnow population exceed the amount of algae available?
3. Using a calculator, Joanna made the following table and then made the following conjecture: 𝟑𝒙 is always greater than (𝟏. 𝟎𝟐) 𝒙 . Is Joanna correct? Explain.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 1 | 1.02 | 3 |
| 2 | 1.0404 | 6 |
| 3 | 1.0612 | 9 |
| 4 | 1.0824 | 12 |
| 5 | 1.1041 | 15 |

1. Here is a classic riddle: Mr. Smith has an apple orchard. He hires his daughter, Lucy, to pick apples and offers her two payment options:

Option A: $1.50 per bushel of apples picked.

Option B: 1 cent for picking one bushel, 3 cents for picking two bushels, 9 cents for picking three bushels, and so on, with the amount of money tripling for each additional bushel picked.

1. Write a function to model each option.
2. If Lucy picks six bushels of apples, which option should she choose?
3. If Lucy picks 12 bushels of apples, which option should she choose?
4. How many bushels of apples does Lucy need to pick to make Option B better for her than Option A?
5. A California Population Projection Engineer in 1920 was tasked with finding a model that predicts the state’s population growth. He modeled the population growth as a function of time, 𝒕 years since 1900. Census data shows that the population in 1900, in thousands, was 𝟏, 𝟒𝟗𝟎. In 1920, the population of the state of California was 𝟑, 𝟓𝟓𝟒 thousand. He decided to explore both a linear and an exponential model.
   1. Use the data provided to determine the equation of the linear function that models the population growth from 1900-1920.
   2. Use the data provide and your calculator to determine the equation of the exponential function that models the population growth.
   3. Use the two functions to predict the populations for the following years:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Projected Population Based on Linear Function, (thousands) | Projected Population Based on Exponential Function, (thousands) | Census Population Data and Estimates for California (thousands) |
| **1935** |  |  | 6175 |
| **1960** |  |  | 15717 |
| **2010** |  |  | 37253 |

* 1. Which function is a better model for the population growth of California in 1935 and in 1960?
  2. Does either model closely predict the population for 2010? What phenomenon explains the real population value?